

SEQUENCE LISTING

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Zahringer, Ulrich

<120> Novel method for the production of polyunsaturated fatty acids

<130> 13478-00001-US

<150> PCT/EP2003/014054

<151> 2003-12-11

<150> GB 0229578.0

<151> 2002-12-19

<150> GB 0316989.3

<151> 2003-07-21

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<170> PatentIn version 3.3

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Ile Glu Asn Tyr Gln Gly Arg Asp Ala Thr Asp Ala Phe Met Val Met	
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ccc aag gtc cgc gaa att tgc gcc aaa cac ggc gtc cac tac gcc tac Pro Lys Val Arg Glu Ile Cys Ala Lys His Gly Val His Tyr Ala Tyr 420 425 430			1296
tac ccg tgg atc cac caa aac ttt ctc tcc acc gtc cgc tac atg cac Tyr Pro Trp Ile His Gln Asn Phe Leu Ser Thr Val Arg Tyr Met His 435 440 445			1344
gcg gcc ggg acc ggt gcc aac tgg cgc cag atg gcc aga gaa aat ccc Ala Ala Gly Thr Gly Ala Asn Trp Arg Gln Met Ala Arg Glu Asn Pro 450 455 460			1392
ttg acc gga cgg gcg taa Leu Thr Gly Arg Ala 465			1410

&lt;210&gt; 6

&lt;211&gt; 469

&lt;212&gt; PRT

<213> *Phaeodactylum tricornutum*

&lt;400&gt; 6

Met	Ala	Pro	Asp	Ala	Asp	Lys	Leu	Arg	Gln	Arg	Gln	Thr	Thr	Ala	Val
1				5					10					15	

Ala Lys His Asn Ala Ala Thr Ile Ser Thr Gln Glu Arg Leu Cys Ser

20					25					30					
Leu	Ser	Ser	Leu	Lys	Gly	Glu	Glu	Val	Cys	Ile	Asp	Gly	Ile	Ile	Tyr
		35					40					45			
Asp	Leu	Gln	Ser	Phe	Asp	His	Pro	Gly	Gly	Glu	Thr	Ile	Lys	Met	Phe
	50					55					60				
Gly	Gly	Asn	Asp	Val	Thr	Val	Gln	Tyr	Lys	Met	Ile	His	Pro	Tyr	His
65						70					75				80
Thr	Glu	Lys	His	Leu	Glu	Lys	Met	Lys	Arg	Val	Gly	Lys	Val	Thr	Asp
				85					90					95	
Phe	Val	Cys	Glu	Tyr	Lys	Phe	Asp	Thr	Glu	Phe	Glu	Arg	Glu	Ile	Lys
			100					105					110		
Arg	Glu	Val	Phe	Lys	Ile	Val	Arg	Arg	Gly	Lys	Asp	Phe	Gly	Thr	Leu
		115					120					125			
Gly	Trp	Phe	Phe	Arg	Ala	Phe	Cys	Tyr	Ile	Ala	Ile	Phe	Phe	Tyr	Leu
	130					135					140				
Gln	Tyr	His	Trp	Val	Thr	Thr	Gly	Thr	Ser	Trp	Leu	Leu	Ala	Val	Ala
145						150					155				160
Tyr	Gly	Ile	Ser	Gln	Ala	Met	Ile	Gly	Met	Asn	Val	Gln	His	Asp	Ala
				165					170					175	
Asn	His	Gly	Ala	Thr	Ser	Lys	Arg	Pro	Trp	Val	Asn	Asp	Met	Leu	Gly
		180						185					190		
Leu	Gly	Ala	Asp	Phe	Ile	Gly	Gly	Ser	Lys	Trp	Leu	Trp	Gln	Glu	Gln
		195					200					205			
His	Trp	Thr	His	His	Ala	Tyr	Thr	Asn	His	Ala	Glu	Met	Asp	Pro	Asp
	210					215					220				
Ser	Phe	Gly	Ala	Glu	Pro	Met	Leu	Leu	Phe	Asn	Asp	Tyr	Pro	Leu	Asp
225						230					235				240
His	Pro	Ala	Arg	Thr	Trp	Leu	His	Arg	Phe	Gln	Ala	Phe	Phe	Tyr	Met
				245					250					255	
Pro	Val	Leu	Ala	Gly	Tyr	Trp	Leu	Ser	Ala	Val	Phe	Asn	Pro	Gln	Ile
			260					265					270		
Leu	Asp	Leu	Gln	Gln	Arg	Gly	Ala	Leu	Ser	Val	Gly	Ile	Arg	Leu	Asp
		275					280					285			
Asn	Ala	Phe	Ile	His	Ser	Arg	Arg	Lys	Tyr	Ala	Val	Phe	Trp	Arg	Ala
	290					295					300				
Val	Tyr	Ile	Ala	Val	Asn	Val	Ile	Ala	Pro	Phe	Tyr	Thr	Asn	Ser	Gly
305						310					315				320
Leu	Glu	Trp	Ser	Trp	Arg	Val	Phe	Gly	Asn	Ile	Met	Leu	Met	Gly	Val

325								330					335				
Ala	Glu	Ser	Leu	Ala	Leu	Ala	Val	Leu	Phe	Ser	Leu	Ser	His	Asn	Phe		
			340						345				350				
Glu	Ser	Ala	Asp	Arg	Asp	Pro	Thr	Ala	Pro	Leu	Lys	Lys	Thr	Gly	Glu		
		355					360					365					
Pro	Val	Asp	Trp	Phe	Lys	Thr	Gln	Val	Glu	Thr	Ser	Cys	Thr	Tyr	Gly		
	370					375					380						
Gly	Phe	Leu	Ser	Gly	Cys	Phe	Thr	Gly	Gly	Leu	Asn	Phe	Gln	Val	Glu		
385					390					395					400		
His	His	Leu	Phe	Pro	Arg	Met	Ser	Ser	Ala	Trp	Tyr	Pro	Tyr	Ile	Ala		
				405					410					415			
Pro	Lys	Val	Arg	Glu	Ile	Cys	Ala	Lys	His	Gly	Val	His	Tyr	Ala	Tyr		
			420					425					430				
Tyr	Pro	Trp	Ile	His	Gln	Asn	Phe	Leu	Ser	Thr	Val	Arg	Tyr	Met	His		
		435					440					445					
Ala	Ala	Gly	Thr	Gly	Ala	Asn	Trp	Arg	Gln	Met	Ala	Arg	Glu	Asn	Pro		
	450					455					460						
Leu	Thr	Gly	Arg	Ala													
465																	

&lt;210&gt; 7

&lt;211&gt; 1344

&lt;212&gt; DNA

&lt;213&gt; Ceratodon purpureus

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (1)..(1344)

&lt;223&gt; delta-5-desaturase

&lt;400&gt; 7

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Met	Val	Leu	Arg	Glu	Gln	Glu	His	Glu	Pro	Phe	Phe	Ile	Lys	Ile	Asp	
1				5				10					15			
gga	aaa	tgg	tgt	caa	att	gac	gat	gct	gtc	ctg	aga	tca	cat	cca	ggg	96
Gly	Lys	Trp	Cys	Gln	Ile	Asp	Asp	Ala	Val	Leu	Arg	Ser	His	Pro	Gly	
			20					25					30			
ggg	agt	gca	att	act	acc	tat	aaa	aat	atg	gat	gcc	act	acc	gta	ttc	144
Gly	Ser	Ala	Ile	Thr	Thr	Tyr	Lys	Asn	Met	Asp	Ala	Thr	Thr	Val	Phe	
		35					40					45				
cac	aca	ttc	cat	act	ggg	tct	aaa	gaa	gcg	tat	caa	tgg	ctg	aca	gaa	192
His	Thr	Phe	His	Thr	Gly	Ser	Lys	Glu	Ala	Tyr	Gln	Trp	Leu	Thr	Glu	
	50					55					60					

ttg	aaa	aaa	gag	tgc	cct	aca	caa	gaa	cca	gag	atc	cca	gat	att	aag	240
Leu	Lys	Lys	Glu	Cys	Pro	Thr	Gln	Glu	Pro	Glu	Ile	Pro	Asp	Ile	Lys	
65					70					75					80	
gat	gac	cca	atc	aaa	gga	att	gat	gat	gtg	aac	atg	gga	act	ttc	aat	288
Asp	Asp	Pro	Ile	Lys	Gly	Ile	Asp	Asp	Val	Asn	Met	Gly	Thr	Phe	Asn	
				85					90					95		
att	tct	gag	aaa	cga	tct	gcc	caa	ata	aat	aaa	agt	ttc	act	gat	cta	336
Ile	Ser	Glu	Lys	Arg	Ser	Ala	Gln	Ile	Asn	Lys	Ser	Phe	Thr	Asp	Leu	
			100					105					110			
cgt	atg	cga	gtt	cgt	gca	gaa	gga	ctt	atg	gat	gga	tct	cct	ttg	ttc	384
Arg	Met	Arg	Val	Arg	Ala	Glu	Gly	Leu	Met	Asp	Gly	Ser	Pro	Leu	Phe	
		115					120					125				
tac	att	aga	aaa	att	ctt	gaa	aca	atc	ttc	aca	att	ctt	ttt	gca	ttc	432
Tyr	Ile	Arg	Lys	Ile	Leu	Glu	Thr	Ile	Phe	Thr	Ile	Leu	Phe	Ala	Phe	
	130					135					140					
tac	ctt	caa	tac	cac	aca	tat	tat	ctt	cca	tca	gct	att	cta	atg	gga	480
Tyr	Leu	Gln	Tyr	His	Thr	Tyr	Tyr	Leu	Pro	Ser	Ala	Ile	Leu	Met	Gly	
145					150					155					160	
gtt	gcg	tgg	caa	caa	ttg	gga	tgg	tta	atc	cat	gaa	ttc	gca	cat	cat	528
Val	Ala	Trp	Gln	Gln	Leu	Gly	Trp	Leu	Ile	His	Glu	Phe	Ala	His	His	
				165					170					175		
cag	ttg	ttc	aaa	aac	aga	tac	tac	aat	gat	ttg	gcc	agc	tat	ttc	gtt	576
Gln	Leu	Phe	Lys	Asn	Arg	Tyr	Tyr	Asn	Asp	Leu	Ala	Ser	Tyr	Phe	Val	
			180					185					190			
gga	aac	ttt	tta	caa	gga	ttc	tca	tct	ggt	ggt	tgg	aaa	gag	cag	cac	624
Gly	Asn	Phe	Leu	Gln	Gly	Phe	Ser	Ser	Gly	Gly	Trp	Lys	Glu	Gln	His	
		195					200					205				
aat	gtg	cat	cac	gca	gcc	aca	aat	gtt	gtt	gga	cga	gac	gga	gat	ctt	672
Asn	Val	His	His	Ala	Ala	Thr	Asn	Val	Val	Gly	Arg	Asp	Gly	Asp	Leu	
	210					215					220					
gat	tta	gtc	cca	ttc	tat	gct	aca	gtg	gca	gaa	cat	ctc	aac	aat	tat	720
Asp	Leu	Val	Pro	Phe	Tyr	Ala	Thr	Val	Ala	Glu	His	Leu	Asn	Asn	Tyr	
225					230					235					240	
tct	cag	gat	tca	tgg	gtt	atg	act	cta	ttc	aga	tgg	caa	cat	gtt	cat	768
Ser	Gln	Asp	Ser	Trp	Val	Met	Thr	Leu	Phe	Arg	Trp	Gln	His	Val	His	
				245					250					255		
tgg	aca	ttc	atg	tta	cca	ttc	ctc	cgt	ctc	tcg	tgg	ctt	ctt	cag	tca	816
Trp	Thr	Phe	Met	Leu	Pro	Phe	Leu	Arg	Leu	Ser	Trp	Leu	Leu	Gln	Ser	
			260					265					270			
atc	att	ttt	gtt	agt	cag	atg	cca	act	cat	tat	tat	gac	tat	tac	aga	864
Ile	Ile	Phe	Val	Ser	Gln	Met	Pro	Thr	His	Tyr	Tyr	Asp	Tyr	Tyr	Arg	
		275					280					285				
aat	act	gcg	att	tat	gaa	cag	gtt	ggt	ctc	tct	ttg	cac	tgg	gct	tgg	912

Asn	Thr	Ala	Ile	Tyr	Glu	Gln	Val	Gly	Leu	Ser	Leu	His	Trp	Ala	Trp	
290						295					300					
tca	ttg	ggg	caa	ttg	tat	ttc	cta	ccc	gat	tgg	tca	act	aga	ata	atg	960
Ser	Leu	Gly	Gln	Leu	Tyr	Phe	Leu	Pro	Asp	Trp	Ser	Thr	Arg	Ile	Met	
305					310					315					320	
ttc	ttc	ctt	gtt	tct	cat	ctt	gtt	gga	ggg	ttc	ctg	ctc	tct	cat	gta	1008
Phe	Phe	Leu	Val	Ser	His	Leu	Val	Gly	Gly	Phe	Leu	Leu	Ser	His	Val	
				325					330					335		
gtt	act	ttc	aat	cat	tat	tca	gtg	gag	aag	ttt	gca	ttg	agc	tcg	aac	1056
Val	Thr	Phe	Asn	His	Tyr	Ser	Val	Glu	Lys	Phe	Ala	Leu	Ser	Ser	Asn	
			340					345					350			
atc	atg	tca	aat	tac	gct	tgt	ctt	caa	atc	atg	acc	aca	aga	aat	atg	1104
Ile	Met	Ser	Asn	Tyr	Ala	Cys	Leu	Gln	Ile	Met	Thr	Thr	Arg	Asn	Met	
			355				360						365			
aga	cct	gga	aga	ttc	att	gac	tgg	ctt	tgg	gga	ggg	ctt	aac	tat	cag	1152
Arg	Pro	Gly	Arg	Phe	Ile	Asp	Trp	Leu	Trp	Gly	Gly	Leu	Asn	Tyr	Gln	
	370					375					380					
att	gag	cac	cat	ctt	ttc	cca	acg	atg	cca	cga	cac	aac	ttg	aac	act	1200
Ile	Glu	His	His	Leu	Phe	Pro	Thr	Met	Pro	Arg	His	Asn	Leu	Asn	Thr	
385					390				395						400	
gtt	atg	cca	ctt	gtt	aag	gag	ttt	gca	gca	gca	aat	ggg	tta	cca	tac	1248
Val	Met	Pro	Leu	Val	Lys	Glu	Phe	Ala	Ala	Ala	Asn	Gly	Leu	Pro	Tyr	
				405				410						415		
atg	gtc	gac	gat	tat	ttc	aca	gga	ttc	tgg	ctt	gaa	att	gag	caa	ttc	1296
Met	Val	Asp	Asp	Tyr	Phe	Thr	Gly	Phe	Trp	Leu	Glu	Ile	Glu	Gln	Phe	
			420					425					430			
cga	aat	att	gca	aat	gtt	gct	gct	aaa	ttg	act	aaa	aag	att	gcc	tag	1344
Arg	Asn	Ile	Ala	Asn	Val	Ala	Ala	Lys	Leu	Thr	Lys	Lys	Ile	Ala		
		435				440					445					

&lt;210&gt; 8

&lt;211&gt; 447

&lt;212&gt; PRT

&lt;213&gt; Ceratodon purpureus

&lt;400&gt; 8

Met	Val	Leu	Arg	Glu	Gln	Glu	His	Glu	Pro	Phe	Phe	Ile	Lys	Ile	Asp	
1				5				10						15		
Gly	Lys	Trp	Cys	Gln	Ile	Asp	Asp	Ala	Val	Leu	Arg	Ser	His	Pro	Gly	
			20					25					30			
Gly	Ser	Ala	Ile	Thr	Thr	Tyr	Lys	Asn	Met	Asp	Ala	Thr	Thr	Val	Phe	
		35					40					45				
His	Thr	Phe	His	Thr	Gly	Ser	Lys	Glu	Ala	Tyr	Gln	Trp	Leu	Thr	Glu	
	50					55					60					

Leu	Lys	Lys	Glu	Cys	Pro	Thr	Gln	Glu	Pro	Glu	Ile	Pro	Asp	Ile	Lys	65	70	75	80
Asp	Asp	Pro	Ile	Lys	Gly	Ile	Asp	Asp	Val	Asn	Met	Gly	Thr	Phe	Asn	85	90	95	
Ile	Ser	Glu	Lys	Arg	Ser	Ala	Gln	Ile	Asn	Lys	Ser	Phe	Thr	Asp	Leu	100	105	110	
Arg	Met	Arg	Val	Arg	Ala	Glu	Gly	Leu	Met	Asp	Gly	Ser	Pro	Leu	Phe	115	120	125	
Tyr	Ile	Arg	Lys	Ile	Leu	Glu	Thr	Ile	Phe	Thr	Ile	Leu	Phe	Ala	Phe	130	135	140	
Tyr	Leu	Gln	Tyr	His	Thr	Tyr	Tyr	Leu	Pro	Ser	Ala	Ile	Leu	Met	Gly	145	150	155	160
Val	Ala	Trp	Gln	Gln	Leu	Gly	Trp	Leu	Ile	His	Glu	Phe	Ala	His	His	165	170	175	
Gln	Leu	Phe	Lys	Asn	Arg	Tyr	Tyr	Asn	Asp	Leu	Ala	Ser	Tyr	Phe	Val	180	185	190	
Gly	Asn	Phe	Leu	Gln	Gly	Phe	Ser	Ser	Gly	Gly	Trp	Lys	Glu	Gln	His	195	200	205	
Asn	Val	His	His	Ala	Ala	Thr	Asn	Val	Val	Gly	Arg	Asp	Gly	Asp	Leu	210	215	220	
Asp	Leu	Val	Pro	Phe	Tyr	Ala	Thr	Val	Ala	Glu	His	Leu	Asn	Asn	Tyr	225	230	235	240
Ser	Gln	Asp	Ser	Trp	Val	Met	Thr	Leu	Phe	Arg	Trp	Gln	His	Val	His	245	250	255	
Trp	Thr	Phe	Met	Leu	Pro	Phe	Leu	Arg	Leu	Ser	Trp	Leu	Leu	Gln	Ser	260	265	270	
Ile	Ile	Phe	Val	Ser	Gln	Met	Pro	Thr	His	Tyr	Tyr	Asp	Tyr	Tyr	Arg	275	280	285	
Asn	Thr	Ala	Ile	Tyr	Glu	Gln	Val	Gly	Leu	Ser	Leu	His	Trp	Ala	Trp	290	295	300	
Ser	Leu	Gly	Gln	Leu	Tyr	Phe	Leu	Pro	Asp	Trp	Ser	Thr	Arg	Ile	Met	305	310	315	320
Phe	Phe	Leu	Val	Ser	His	Leu	Val	Gly	Gly	Phe	Leu	Leu	Ser	His	Val	325	330	335	
Val	Thr	Phe	Asn	His	Tyr	Ser	Val	Glu	Lys	Phe	Ala	Leu	Ser	Ser	Asn	340	345	350	
Ile	Met	Ser	Asn	Tyr	Ala	Cys	Leu	Gln	Ile	Met	Thr	Thr	Arg	Asn	Met	355	360	365	

Arg Pro Gly Arg Phe Ile Asp Trp Leu Trp Gly Gly Leu Asn Tyr Gln  
 370 375 380  
 Ile Glu His His Leu Phe Pro Thr Met Pro Arg His Asn Leu Asn Thr  
 385 390 395 400  
 Val Met Pro Leu Val Lys Glu Phe Ala Ala Ala Asn Gly Leu Pro Tyr  
 405 410 415  
 Met Val Asp Asp Tyr Phe Thr Gly Phe Trp Leu Glu Ile Glu Gln Phe  
 420 425 430  
 Arg Asn Ile Ala Asn Val Ala Ala Lys Leu Thr Lys Lys Ile Ala  
 435 440 445

<210> 9  
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 <212> DNA  
 <213> *Physcomitrella patens*

<220>  
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 <222> (1)..(1443)  
 <223> delta-5-desaturase

<220>  
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 <223> k is g or t/u

<220>  
 <221> misc\_feature  
 <222> (361)..(361)  
 <223> r is g or a

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 1 5 10 15  
 ttg agg cta cga acg tcg aat tca aag ggt ccc gaa caa gag caa act 96  
 Leu Arg Leu Arg Thr Ser Asn Ser Lys Gly Pro Glu Gln Glu Gln Thr  
 20 25 30  
 ttg aag aag tac acc ctt gaa gat gtc agc cgc cac aac acc cca gca 144  
 Leu Lys Lys Tyr Thr Leu Glu Asp Val Ser Arg His Asn Thr Pro Ala  
 35 40 45  
 gat tgt tgg ttg gtg ata tgg ggc aaa gtc tac gat gtc aca agc tgg 192  
 Asp Cys Trp Leu Val Ile Trp Gly Lys Val Tyr Asp Val Thr Ser Trp  
 50 55 60  
 att ccc aat cat ccg ggg ggc agt ctc atc cac gta aaa gca ggg cag 240  
 Ile Pro Asn His Pro Gly Gly Ser Leu Ile His Val Lys Ala Gly Gln  
 65 70 75 80

gat tcc act cag ctt ttc gat tcc tat cac ccc ctt tat gtc agg aaa	288
Asp Ser Thr Gln Leu Phe Asp Ser Tyr His Pro Leu Tyr Val Arg Lys	
85 90 95	
atg ctc gcg aag tac tgt att ggg gaa tka gta ccg tct gct ggt gat	336
Met Leu Ala Lys Tyr Cys Ile Gly Glu Xaa Val Pro Ser Ala Gly Asp	
100 105 110	
gac aag ttt aag aaa gca act ctg rag tat gca gat gcc gaa aat gaa	384
Asp Lys Phe Lys Lys Ala Thr Leu Xaa Tyr Ala Asp Ala Glu Asn Glu	
115 120 125	
gat ttc tat ttg gtt gtg aag caa cga gtt gaa tct tat ttc aag agt	432
Asp Phe Tyr Leu Val Val Lys Gln Arg Val Glu Ser Tyr Phe Lys Ser	
130 135 140	
aac aag ata aac ccc caa att cat cca cat atg atc ctg aag tca ttg	480
Asn Lys Ile Asn Pro Gln Ile His Pro His Met Ile Leu Lys Ser Leu	
145 150 155 160	
ttc att ctt ggg gga tat ttc gcc agt tac tat tta gcg ttc ttc tgg	528
Phe Ile Leu Gly Gly Tyr Phe Ala Ser Tyr Tyr Leu Ala Phe Phe Trp	
165 170 175	
tct tca agt gtc ctt gtt tct ttg ttt ttc gca ttg tgg atg ggg ttc	576
Ser Ser Ser Val Leu Val Ser Leu Phe Phe Ala Leu Trp Met Gly Phe	
180 185 190	
ttc gca gcg gaa gtc ggc gtg tcg att caa cat gat gga aat cat ggt	624
Phe Ala Ala Glu Val Gly Val Ser Ile Gln His Asp Gly Asn His Gly	
195 200 205	
tca tac act aaa tgg cgt ggc ttt gga tat atc atg gga gcc tcc cta	672
Ser Tyr Thr Lys Trp Arg Gly Phe Gly Tyr Ile Met Gly Ala Ser Leu	
210 215 220	
gat cta gtc gga gcc agt agc ttc atg tgg aga cag caa cac gtt gtg	720
Asp Leu Val Gly Ala Ser Ser Phe Met Trp Arg Gln Gln His Val Val	
225 230 235 240	
gga cat cac tcg ttt aca aat gtg gac aac tac gat cct gat att cgt	768
Gly His His Ser Phe Thr Asn Val Asp Asn Tyr Asp Pro Asp Ile Arg	
245 250 255	
gtg aaa gat cca gat gtc agg agg gtt gcg acc aca caa cca aga caa	816
Val Lys Asp Pro Asp Val Arg Arg Val Ala Thr Thr Gln Pro Arg Gln	
260 265 270	
tgg tat cat gcg tat cag cat atc tac ctg gca gta tta tat gga act	864
Trp Tyr His Ala Tyr Gln His Ile Tyr Leu Ala Val Leu Tyr Gly Thr	
275 280 285	
cta gct ctt aag agt att ttt cta gat gat ttc ctt gcg tac ttc aca	912
Leu Ala Leu Lys Ser Ile Phe Leu Asp Asp Phe Leu Ala Tyr Phe Thr	
290 295 300	



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gga tca att ggc cct gtc aag gtg gcg aaa atg acc ccc ctg gag ttc 960
Gly Ser Ile Gly Pro Val Lys Val Ala Lys Met Thr Pro Leu Glu Phe
305                      310                      315                      320

aac atc ttc ttt cag gga aag ctg cta tat gcg ttc tac atg ttc gtg 1008
Asn Ile Phe Phe Gln Gly Lys Leu Leu Tyr Ala Phe Tyr Met Phe Val
                      325                      330                      335

ttg cca tct gtg tac ggt gtt cac tcc gga gga act ttc ttg gca cta 1056
Leu Pro Ser Val Tyr Gly Val His Ser Gly Gly Thr Phe Leu Ala Leu
                      340                      345                      350

tat gtg gct tct cag ctc att aca ggt tgg atg tta gct ttt ctt ttt 1104
Tyr Val Ala Ser Gln Leu Ile Thr Gly Trp Met Leu Ala Phe Leu Phe
                      355                      360                      365

caa gta gca cat gtc gtg gat gat gtt gca ttt cct aca cca gaa ggt 1152
Gln Val Ala His Val Val Asp Asp Val Ala Phe Pro Thr Pro Glu Gly
                      370                      375                      380

ggg aag gtg aag gga gga tgg gct gca atg cag gtt gca aca act acg 1200
Gly Lys Val Lys Gly Gly Trp Ala Ala Met Gln Val Ala Thr Thr Thr
385                      390                      395                      400

gat ttc agt cca cgc tca tgg ttc tgg ggt cat gtc tct gga gga tta 1248
Asp Phe Ser Pro Arg Ser Trp Phe Trp Gly His Val Ser Gly Gly Leu
                      405                      410                      415

aac aac caa att gag cat cat ctg ttt cca gga gtg tgc cat gtt cat 1296
Asn Asn Gln Ile Glu His His Leu Phe Pro Gly Val Cys His Val His
                      420                      425                      430

tat cca gcc att cag cct att gtc gag aag acg tgc aag gaa ttc gat 1344
Tyr Pro Ala Ile Gln Pro Ile Val Glu Lys Thr Cys Lys Glu Phe Asp
                      435                      440                      445

gtg cct tat gta gcc tac cca act ttt tgg act gcg ttg aga gcc cac 1392
Val Pro Tyr Val Ala Tyr Pro Thr Phe Trp Thr Ala Leu Arg Ala His
                      450                      455                      460

ttt gcg cat ttg aaa aag gtt gga ttg aca gag ttt cgg ctc gat ggc 1440
Phe Ala His Leu Lys Lys Val Gly Leu Thr Glu Phe Arg Leu Asp Gly
465                      470                      475                      480

tga 1443

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<210> 10

<211> 480

<212> PRT

<213> *Physcomitrella patens*

<220>

<221> misc\_feature

<222> (106)..(106)

<223> Xaa is unknown or other

&lt;220&gt;

&lt;221&gt; misc\_feature

&lt;222&gt; (121)..(121)

&lt;223&gt; Xaa is unknown or other

&lt;400&gt; 10

Met	Ala	Pro	His	Ser	Ala	Asp	Thr	Ala	Gly	Leu	Val	Pro	Ser	Asp	Glu
1				5					10					15	
Leu	Arg	Leu	Arg	Thr	Ser	Asn	Ser	Lys	Gly	Pro	Glu	Gln	Glu	Gln	Thr
			20					25					30		
Leu	Lys	Lys	Tyr	Thr	Leu	Glu	Asp	Val	Ser	Arg	His	Asn	Thr	Pro	Ala
		35					40					45			
Asp	Cys	Trp	Leu	Val	Ile	Trp	Gly	Lys	Val	Tyr	Asp	Val	Thr	Ser	Trp
	50					55					60				
Ile	Pro	Asn	His	Pro	Gly	Gly	Ser	Leu	Ile	His	Val	Lys	Ala	Gly	Gln
65					70					75					80
Asp	Ser	Thr	Gln	Leu	Phe	Asp	Ser	Tyr	His	Pro	Leu	Tyr	Val	Arg	Lys
				85					90					95	
Met	Leu	Ala	Lys	Tyr	Cys	Ile	Gly	Glu	Xaa	Val	Pro	Ser	Ala	Gly	Asp
			100					105					110		
Asp	Lys	Phe	Lys	Lys	Ala	Thr	Leu	Xaa	Tyr	Ala	Asp	Ala	Glu	Asn	Glu
		115					120					125			
Asp	Phe	Tyr	Leu	Val	Val	Lys	Gln	Arg	Val	Glu	Ser	Tyr	Phe	Lys	Ser
	130					135						140			
Asn	Lys	Ile	Asn	Pro	Gln	Ile	His	Pro	His	Met	Ile	Leu	Lys	Ser	Leu
145					150					155					160
Phe	Ile	Leu	Gly	Gly	Tyr	Phe	Ala	Ser	Tyr	Tyr	Leu	Ala	Phe	Phe	Trp
			165						170					175	
Ser	Ser	Ser	Val	Leu	Val	Ser	Leu	Phe	Phe	Ala	Leu	Trp	Met	Gly	Phe
			180					185					190		
Phe	Ala	Ala	Glu	Val	Gly	Val	Ser	Ile	Gln	His	Asp	Gly	Asn	His	Gly
		195					200					205			
Ser	Tyr	Thr	Lys	Trp	Arg	Gly	Phe	Gly	Tyr	Ile	Met	Gly	Ala	Ser	Leu
	210					215					220				
Asp	Leu	Val	Gly	Ala	Ser	Ser	Phe	Met	Trp	Arg	Gln	Gln	His	Val	Val
225					230				235						240
Gly	His	His	Ser	Phe	Thr	Asn	Val	Asp	Asn	Tyr	Asp	Pro	Asp	Ile	Arg
				245					250					255	
Val	Lys	Asp	Pro	Asp	Val	Arg	Arg	Val	Ala	Thr	Thr	Gln	Pro	Arg	Gln
			260					265					270		

Trp	Tyr	His	Ala	Tyr	Gln	His	Ile	Tyr	Leu	Ala	Val	Leu	Tyr	Gly	Thr	275	280	285
Leu	Ala	Leu	Lys	Ser	Ile	Phe	Leu	Asp	Asp	Phe	Leu	Ala	Tyr	Phe	Thr	290	295	300
Gly	Ser	Ile	Gly	Pro	Val	Lys	Val	Ala	Lys	Met	Thr	Pro	Leu	Glu	Phe	305	310	315
Asn	Ile	Phe	Phe	Gln	Gly	Lys	Leu	Leu	Tyr	Ala	Phe	Tyr	Met	Phe	Val	325	330	335
Leu	Pro	Ser	Val	Tyr	Gly	Val	His	Ser	Gly	Gly	Thr	Phe	Leu	Ala	Leu	340	345	350
Tyr	Val	Ala	Ser	Gln	Leu	Ile	Thr	Gly	Trp	Met	Leu	Ala	Phe	Leu	Phe	355	360	365
Gln	Val	Ala	His	Val	Val	Asp	Asp	Val	Ala	Phe	Pro	Thr	Pro	Glu	Gly	370	375	380
Gly	Lys	Val	Lys	Gly	Gly	Trp	Ala	Ala	Met	Gln	Val	Ala	Thr	Thr	Thr	385	390	395
Asp	Phe	Ser	Pro	Arg	Ser	Trp	Phe	Trp	Gly	His	Val	Ser	Gly	Gly	Leu	405	410	415
Asn	Asn	Gln	Ile	Glu	His	His	Leu	Phe	Pro	Gly	Val	Cys	His	Val	His	420	425	430
Tyr	Pro	Ala	Ile	Gln	Pro	Ile	Val	Glu	Lys	Thr	Cys	Lys	Glu	Phe	Asp	435	440	445
Val	Pro	Tyr	Val	Ala	Tyr	Pro	Thr	Phe	Trp	Thr	Ala	Leu	Arg	Ala	His	450	455	460
Phe	Ala	His	Leu	Lys	Lys	Val	Gly	Leu	Thr	Glu	Phe	Arg	Leu	Asp	Gly	465	470	475
																480		